

## CLAIMS

1. A method using efficient heuristics in selecting a materialized view (MV) from multiple materialized views matching a query, said method comprising the steps of:

(a) receiving a query,  $Q$ ;

5 (b) ordering materialized view candidates in a list based upon a descending order of reduction powers, wherein reduction power is a function of cardinalities of common tables between query,  $Q$ , and materialized view definition,  $V$ , and cardinality of  $M$ ; and

(c) matching a query with materialized views in said ordered list by identifying a materialized view candidate based on any of, or a combination of, the following  
10 heuristics: avoid choosing an MV which is locked by REFRESH process, choosing a matching that does not require regrouping, choosing a matching that does not require a rejoin, choosing a matching that does not have a residual join, choosing an MV with the largest reduction power, or an equivalent of the foregoing.

15 2. A method using efficient heuristics in selecting a materialized view (MV) from multiple materialized views matching a query, as per claim 1, wherein said query is an SQL query.

3. A method using efficient heuristics in selecting a materialized view (MV) from  
20 multiple materialized views matching a query, as per claim 1, wherein said reduction power of a materialized view,  $M$ , is defined as a product of cardinalities of common

tables,  $T1$  through  $Tn$ , between query,  $Q$ , and materialized view definition,  $V$ , divided by the cardinality of  $M$ , as given by:

$$|T1| * \dots * |Tn| / |M|.$$

- 5     4.     A method using efficient heuristics in selecting a materialized view (MV) from multiple materialized views matching a query, as per claim 1, wherein said method further comprises the steps of:

rewriting said received query based upon identified materialized view candidate;

and

- 10     comparing a cost associated with said received query and said rewritten query and identifying query with a lower cost; and

executing said query with lower cost.

5.     A method using efficient heuristics in selecting a materialized view (MV) from  
15 multiple materialized views matching a query, as per claim 1, wherein said matching step further comprises:

(a) looping sorted list of MV candidates starting from first MV candidate as a current candidate;

(b) loading MV definition from catalog;

- 20     (c) checking if matching involves regrouping, joining, or residual joining, and, if current MV candidate is locked by REFRESH process;

(d) checking if first matching MV is not a match;

(e) checking and marking if no regrouping match is found;

(f) identifying if no regrouping match was found and if the current MV candidate needs regrouping, and if so, picking best matching MV using said heuristics and if a MV  
5 is not picked, marking the picked MV such that during later matching the first matching MV is picked,

whereby abovementioned steps are repeated for each MV candidate in said list.

6. A method using efficient heuristics in selecting a materialized view (MV) from  
10 multiple materialized views matching a query, as per claim 5, wherein said method further comprises the steps of:

(a) looping through matched MVs based on reduction power order;

(b) checking if there is regrouping and rejoin matching and if MV is locked by REFRESH processing, else marking current MV as selected MV;

15 (c) checking if there is regrouping matching and if MV is locked by REFRESH processing, else marking current MV as selected MV;

(d) checking if there is a rejoin matching and residual join matching and if MV is locked by REFRESH processing, else marking current MV as selected MV;

(e) checking if there is a rejoin matching and if MV is locked by REFRESH  
20 processing, else marking current MV as selected MV;

(f) checking if there is a residual join matching and if MV is locked by REFRESH processing, else marking current MV as selected MV,

whereby abovementioned steps are repeated for each MV candidate until an MV is picked.

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7. A method using efficient heuristics in selecting a materialized view (MV) from multiple materialized views matching a query, as per claim 1, wherein said method is implemented across one or more networks.

10 8. A method using efficient heuristics in selecting a materialized view (MV) from multiple materialized views matching a query, as per claim 7, wherein network is any of the following: local area network, wide area network, or the Internet.

9. An article of manufacture comprising a computer usable medium having  
15 computer readable program code embodied therein which implements efficient heuristics to select a materialized view (MV) from multiple materialized views matching a query, said medium comprising:

(a) computer readable program code aiding in receiving a query,  $Q$ ;

(b) computer readable program code ordering materialized view candidates in a  
20 list based upon a descending order of reduction powers, wherein reduction power is a

function of cardinalities of common tables between query,  $Q$ , and materialized view definition,  $V$ , and cardinality of  $M$ ; and

(c) computer readable program code matching a query with materialized views in said ordered list by identifying a materialized view candidate based on any of, or a combination of, the following heuristics: avoid choosing an MV which is locked by REFRESH process, choosing a matching that does not require regrouping, choosing a matching that does not require a rejoin, choosing a matching that does not have a residual join, choosing an MV with the largest reduction power, or an equivalent of the foregoing.

10 10. An article of manufacture comprising a computer usable medium having computer readable program code embodied therein which implements efficient heuristics to select a materialized view (MV) from multiple materialized views matching a query, as per claim 9, wherein said reduction power of a materialized view,  $M$ , is defined as a product of cardinalities of common tables,  $T1$  through  $Tn$ , between query,  $Q$ , and  
15 materialized view definition,  $V$ , divided by the cardinality of  $M$ , as given by:

$$|T1| * \dots * |Tn| / |M|.$$

11. An article of manufacture comprising a computer usable medium having computer readable program code embodied therein which implements efficient heuristics  
20 to select a materialized view (MV) from multiple materialized views matching a query, as per claim 9, wherein said medium further comprises:

- (a) computer readable program code looping sorted list of MV candidates starting from first MV candidate as a current candidate;
  - (b) computer readable program code loading MV definition from catalog;
  - (c) computer readable program code checking if matching involves regrouping, joining, or residual joining, and, if current MV candidate is locked by REFRESH process;
  - (d) computer readable program code checking if first matching MV is not a match;
  - (e) computer readable program code checking and marking if no regrouping match is found;
  - (f) computer readable program code identifying if no regrouping match was found and if the current MV candidate needs regrouping, and if so, picking best matching MV using said heuristics and if a MV is not picked, marking the picked MV such that during later matching the first matching MV is picked,
- whereby computer readable program code repeats abovementioned steps for each MV candidate in said list.

12. An article of manufacture comprising a computer usable medium having computer readable program code embodied therein which implements efficient heuristics to select a materialized view (MV) from multiple materialized views matching a query, as per claim 11, wherein said medium further comprises:

(a) computer readable program code looping through matched MVs based on reduction power order;

(b) computer readable program code checking if there is a regrouping and rejoin matching and if MV is locked by REFRESH processing, else marking current MV as  
5 selected MV;

(c) computer readable program code checking if there is a regrouping matching and if MV is locked by REFRESH processing, else marking current MV as selected MV;

(d) computer readable program code checking if there is a rejoin matching and residual join matching and if MV is locked by REFRESH processing, else marking  
10 current MV as selected MV;

(e) computer readable program code checking if there is a rejoin matching and if MV is locked by REFRESH processing, else marking current MV as selected MV;

(f) computer readable program code checking if there is a residual join matching and if MV is locked by REFRESH processing, else marking current MV as selected MV,  
15 whereby computer readable program code repeats abovementioned steps for each MV candidate until an MV is picked.

13. An article of manufacture comprising a computer usable medium having computer readable program code embodied therein which implements efficient heuristics  
20 to select a materialized view (MV) from multiple materialized views matching a query, as per claim 9, wherein said query is an SQL query.

14. A method using efficient heuristics in selecting a materialized view (MV) from multiple materialized views matching a query, said method comprising the steps of:

(a) receiving a query,  $Q$ ;

5 (b) ordering materialized view candidates in a list based upon a descending order of reduction powers, wherein reduction power of a materialized view,  $M$ , is defined as a product of cardinalities of common tables,  $T1$  through  $Tn$ , between query,  $Q$ , and material definition,  $V$ , divided by the cardinality of  $M$  as given by:

$$|T1| * \dots * |Tn| / |M| ; \text{ and}$$

10 (c) matching a query with materialized views in said ordered list by identifying a materialized view candidate not locked by a REFRESH process, said matching performed until a materialized view candidate is identified as follows:

identifying an MV candidate as a matching MV that does not require a regrouping, else;

15 identifying an MV candidate as a matching MV that does not require a rejoin, else;

identifying an MV candidate as a matching MV that does not require a residual join, else;

20 identifying an MV candidate as an MV with largest reduction power from said list of candidates.



15. A method using efficient heuristics in selecting a materialized view (MV) from multiple materialized views matching a query, as per claim 14, wherein said method further comprises the steps of:

rewriting said received query based upon identified materialized view candidate;

5 and

comparing a cost associated with said received query and said rewritten query and identifying query with a lower cost; and

executing said query with lower cost.

10 16. A method using efficient heuristics in selecting a materialized view (MV) from multiple materialized views matching a query, as per claim 14, wherein said query is an SQL query.

17. A method using efficient heuristics in selecting a materialized view (MV) from  
15 multiple materialized views matching a query, as per claim 14, wherein said method is implemented across one or more networks.

18. A method using efficient heuristics in selecting a materialized view (MV) from multiple materialized views matching a query, as per claim 17, wherein network is any of  
20 the following: local area network, wide area network, or the Internet.

19. An article of manufacture comprising a computer usable medium having computer readable program code embodied therein which implements efficient heuristics to select a materialized view (MV) from multiple materialized views matching a query, said medium comprising:

5 (a) computer readable program code aiding in receiving a query,  $Q$ ;

(b) computer readable program code ordering materialized view candidates in a list based upon a descending order of reduction powers, wherein reduction power of a materialized view,  $M$ , is defined as a product of cardinalities of common tables,  $T1$  through  $Tn$ , between query,  $Q$ , and materialized view definition,  $V$ , divided by the  
10 cardinality of  $M$  as given by:

$$|T1| * \dots * |Tn| / |M| ; \text{ and}$$

(c) computer readable program code matching a query with materialized views in said ordered list by identifying a materialized view candidate not locked by a REFRESH process, said matching performed until a materialized view candidate is identified as  
15 follows:

computer readable program code identifying an MV candidate as a matching MV that does not require regrouping, else;

computer readable program code identifying an MV candidate as a matching MV that does not require a rejoin, else;

20 computer readable program code identifying an MV candidate as a matching MV that does not require a residual join, else;

computer readable program code identifying an MV candidate as an MV  
with largest reduction power from said list of candidates.

20. An article of manufacture comprising a computer usable medium having  
5 computer readable program code embodied therein which implements efficient heuristics  
to select a materialized view (MV) from multiple materialized views matching a query,  
as per claim 19, wherein said medium further comprises:

computer readable program code rewriting said received query based upon  
identified materialized view candidate; and

10 computer readable program code comparing a cost associated with said received  
query and said rewritten query and identifying query with a lower cost; and

computer readable program code executing said query with lower cost.

21. An article of manufacture comprising a computer usable medium having  
15 computer readable program code embodied therein which implements efficient heuristics  
to select a materialized view (MV) from multiple materialized views matching a query,  
as per claim 19, wherein said query is an SQL query.